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SOME LEGAL QUESTIONS

CONNECTED WITH CRIMINAL POISONING.

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SOME LEGAL QUESTIONS

CONNECTED WITH CRIMINAL POISONING.

Of all the forms of crime, poisoning is probably the one in which it is the most difficult to detect and convict the perpetrator. The comparative absence of danger and the secrecy with which murder can be accomplished by poison has made it a favorite means of homicide, as well as suicide, in all ages and nations.

In the five years 1867 to 1871, two thousand and ninety-seven persons are reported to have died from poisoning in England and Wales. In one thousand six hundred twenty of these cases the nature of the poison was unknown. Of this number the following poisons killed the numbers given:

Opium - various preparations -----	680.
Lead Salts -----	240.
Cyanides - including prussic acid -----	180.
Acids - Sulphuric, Nitric, Hydrochloric -	74.
Oxalic Acid -----	60.
Mercury -----	53.
Strychnine -----	41.
Alcohol -----	35.
"Worm-powder" -----	20.
Phosphorous -----	15.
Ammonia -----	11.
Too large doses of medicine -----	57.
Unsuitable food -----	33.
Unsuitable medicine -----	17.
Poisonous Shell-fish -----	8.

Total -- 110.

"Other poisons" ----- 55.



In France the total accusations of poisoning for twenty-one years(1851to 1871) was 793.

The accused were:men--304,women--399

The numbers killed by the poisons named below were as follows:

Arsenic -----	287.
Phosphorus -----	287.
Copper Salts -----	159.
Mineral Acids -----	47.
Cantharides -----	30.
Stychnine -----	12.
Opium-Preparations -----	10.
Mercury Salts -----	8.
Sulphate of Iron -----	6.
Antimony preparations -----	5.
Ammonia -----	4.
Cyanides -----	4.

These figures include suicidal and accidental poisonings as well as criminal. Plyth on Poison,pp,50.

The proportion of poisoning to other crimes in France and Belgium was as follows,per annum for the years 1888 to 1886.

	France	Belgium
Assassinations -----	388,	49.
Infanticide -----	429,	32.
Poisonings -----	62,	6.
Parricides -----	18,	1.
Simple Homocides -----	502,	81.
Total--	1478,	133.

In Italy during the year 1887 there were twenty accusations of poisoning,of whom 65% were convicted.

The proportion of women among the accused as to the various crimes is as follows:

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	France	Beldium	Italy
Poisoning -----	57.14%	72.73%	47.80%
Parricide -----	12.09%	--	10.00%
Assassinations -----	15.38%	11.18%	2.11%
Simple Homocide -----	5.70%	8.98%	2.13%
Assault followed by death---	5.09%	8.96%	3.87%

This shows that poisoning is the favorite crime of women.

There are no statistics on this subject in America that I have been able to find,

The ancients knew of the poisonous properties of opium, hyoscamus, (henbane), colchicum, ^oguine (henlock), aconite, and other vegetable poisons. Among the mineral poisons they knew arsenic, the salts of copper, oxide of lead, and sulphide of mercury (cinibar).

In India it is said that domestic poisoning became so frequent that as a preventative the Brahmans invented the "sut-tee", or immolation of the widow on her husbands funeral pyre, which, as may be imagined, affectually stopped the practice.

From the fifteenth to the seventeenth centuries there were two great schools of poisoners; one in Italy, the other in Venice. In Venice the government recognised secret assassinations by poison as one of its means of proceeding against enemies. Dec. 15th, 1513 as the records show, they entered into a contract with a monk, Jno. of Raguso, to remove obnoxious persons. A regular price list was agreed upon; 500 ducats for poisoning the Great Sultan, 150 ducats for the King of Spain, 50 ducats for the Duke of Milan, 100 ducats for the Pope.

In Bologna a woman named Toffana sold a solution of arsenic tri-oxide under the name of Acquetta de Napol,-chiefly to young wives who were tired of old husbands. She had a flourishing trade for many years and is supposed to have poisoned six hundred persons, among them two popes, Pius III and Clement XIV. She lived until seventeen thirty.

The comparative immunity in modern times from poisoning is chiefly due to the progress of chemistry and toxicology which has made possible the detection with great certainty of all the poisons commonly accessible to criminals and, while accidental and suicidal poisonings are still frequent, criminal poisonings has become much more infrequent than formerly. Criminal Law Magazine 1-293 et. sq. Evidence

In a case of criminal poisoning the evidence is usually wholly circumstantial. Aside from the confessions of the accused it is seldom that direct evidence is ever obtained of the administration of the deadly substance. It is its secrecy that renders this form of crime so attractive.

As in all cases of homicide the first thing to be established is the corpus delicti and in this sort of crime it involves, in addition to the fact that death has occurred, the proof that poison was the cause of death.

The evidence under this head may be furnished by one or more of the following classes of facts: (1) Symptoms, (2) Post-mortem examination, (3) Chemical analysis. The next step to be established is the administration of the poison by the accused.

And lastly knowledge by the accused of the poisonous properties of the substance. The following tabular form of evidence in a poisoning case has been proposed.

Medico-Legal Journal Dec.1888.

Murder by Poisoning.

Facts to be proven.	direct evidence	admissions confessions	Circumstantial evidence.
I. Death of deceased by poison.	&c.	&c.	I. A. Symptoms. B. Post-mortum. C. Chemical analysis.
II. Administration of poison by the ac- used.	&c.	&c.	II. A. Previous pos- session of the poisonous sub. B. Opportunity o of administration C. Motive Possibility or Probability or Impossibility or Improbability of administration by another agency.
III. Knowledge by the accused of the prob- able poisonous effect of the substance given.	&c.	&c.	&c.

Under the first division, as to symptoms, the strongest evidence is in those cases in which sudden illness occurs soon after eating or drinking and continues with little or no intermission to a fatal conclusion. The presumption of poisoning is much strengthened if two or more ate or drank the same food and were effected in the same manner. It must always be borne in mind that evidence from symptoms alone, is never conclusive for;

the symptoms of many natural diseases very closely resemble those produced by poisons. The disease whose symptoms most resemble those of irritant poisons are; cholera morbus, malignant cholera, gastro-enteritis, peritonitis, ulceration of the stomach and hernia. Those most nearly resembling narcotic poisoning are apoplexy, epilepsy, inflammation of the brain, tetanus, and heart disease. But where symptoms occur in a previously healthy person and are well marked they furnish valuable confirmatory evidence.

As to the evidence furnished by the post-mortum examination it is also not conclusive for the same reason; namely, because diseases simulate many of the post-mortum occurrences produced by poisoning. The strongest evidence furnished by a post-mortum are (1) external stains, such as those produced by strong mineral acids and (2) the odors of certain poisons, such as chloroform, prussic acid, phosphorous, opium, alcohol, nicotine, etc. which will be detected on opening the body. The irritant poisons usually produce intense inflammation and often perforation or ulceration of the stomach and the absence of all these appearances would be strong although not conclusive evidence against the presence of this class of poisons. The narcotic poisons affect the nervous centers such as the brain and spinal cord; the post-mortum appearances commonly being congestion, ^{and} inflammation of these organs.

The most satisfactory evidence of poisoning is that furnished by the chemical analysis. If the post-mortum examination

has been properly conducted and the organs reserved for analysis have been kept in proper custody prior to their delivery to the chemist, the finding of poison therein is almost conclusive evidence of death by poisoning.

Joe v. State, 6 Fla. 591.

But the effect of the post-mortem diffusion of poisons, described below must be taken into account.

The above facts are usually proven by expert testimony and the evidence is governed by the general rules concerning expert evidence. However we may note, that for the purposes of such an investigation, an expert chemist is also an expert as to the effect of various poisons on the system and the fatal dose.

State v. Cook, 17 Kan. 392.

An expert ^{may} ~~should~~ also give his opinion whether death in the particular case resulted from the effects of the poison discovered.

State v. Mitchell, 58 Alabama 418.

It is not absolutely necessary that poison be found by a chemical analysis to sustain a conviction provided the evidence on the other points is clear and convincing. It is sufficient if the jury is satisfied from all the circumstances beyond a reasonable doubt that death was caused by poison administered by the prisoner.

Greenleaf Evidence, III, 159.

Poison may not be discovered for any of the following reasons; (1) Removal by vomiting and purging.

(2) No known chemical reaction for the particular poison

(3) It may be lost by absorption or elimination.

(4) Decomposition of the poison in the blood during elimination.

(5) Decomposition in the dead body.

(6) Presence of ptomaines which may mask the reactions or give reactions resembling those produced by the alleged poison.

However in reference to the second proposition, there are very few poisons accessible to the general public that cannot be detected by chemical analysis.

Crim. Law Mag. May, 1880.

In all cases of suspected poisoning the urine, faeces, and vomit should be preserved as if poison is discovered in these it will be conclusive evidence of the administration of poison during life. It is not necessary that sufficient poison be found in the stomach to have caused death. The quantity in the stomach is in reality only the excess of the amount that has produced the fatal results. The question whether the substance administered in a given case is a poison is a question of fact for the jury.

1 Pa. Sup. Ct. cases, 431. (1889)

Eng. and Amer. Ency. Law, 15-242.

Having proven by the above described evidence that death has been caused by poison the next step is to prove that it was administered by the accused. The links in the evidence to this point are those enumerated under II in the table, - (1) previous possession of the poison by the accused, (2) opportunity for administering it, (3) and motive for administering it. Proof by the defense of the complete absence of the 1st or 2nd of these links would be fatal to the prosecution. As to motive the defense can

only prove probable absence of motive for the workings of the mind are hidden and no one can tell what secret motives may be at work therein. In order to prove motive the examination is allowed to take a wide range. Evidence of a continuing scheme has been admitted whereby the accused first poisoned her sister and then her sister's husband in order to get a benefit insurance of \$2000 on his life.

Com.v.Robinson, 146 Mass.578.

It is admissable to show criminal intimacy between a prisoner and the wife or husband of the deceased.

Peo.v.Templeton, 27 Mich.501.

Peo.v.Millard, 53 Mich.63.

State v. Link, 6 Iowa 380.

2 Crim.Law Mag.235.

10 " " " 545.

Peo.v.Hartung, 4 Park.Cr.Cas.(N.Y.)235.

Evidence of previous poisoning is admissable even though it be a separate crime if it bears on the question of motive.

Peo.v.Templeton, 27 Mich.501.

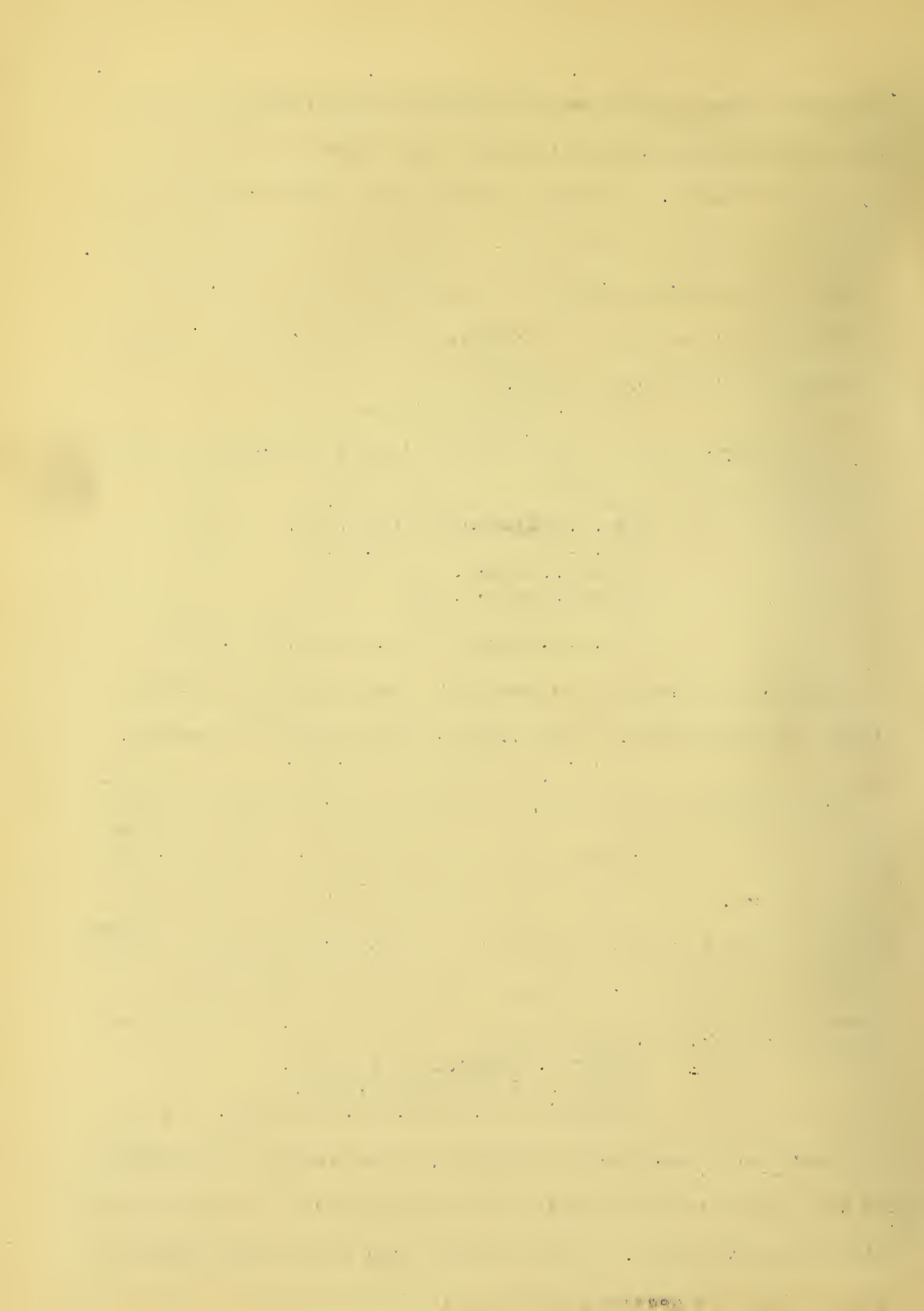
The poisonous nature of the substance administered and its capabilities of destroying life must be proved. In a Miss.case it having been proven that the prisoner attempted to poison a family by putting Rough on Rats in meal, the conviction was never the less reversed on the ground that the poisonous nature of Rough on Rats had not been shown.

State v.Osborne, 64 Miss.318.

State v.Clariissa, 11 Ala.57.

Elwell's Med.Juris.sec.837 & 843.

That the accused had knowledge of the poisonous properties of the substance will usually be inferred from the circumstance surrounding the case. If the accused sets up the plea that he did not know the poisonous nature of the substance



(which is seldom done) it would probably require exceedingly clear evidence on that point to have any weight with the jury, at least with respect to substances commonly known to be poisonous.

Malicious intent is implied where a poison is administered of a kind and quantity ordinarily sufficient to kill.

State v. Wagoner, 27 Mo. 644.

State v. Wells, 1 Kan. 365.

State v. Sanchez, 24 Cal. 17.

Phill. (N.C.) 450

A wide variety of evidence is admissible on the point of intent; for example, that the accused had threatened the deceased with injury from a slung-shot.

Peo. v. LeBeau, 21 N.Y. 223.

Among the general circumstantial evidence which may be valuable in confirming other evidence the following may be mentioned: The conduct of the accused in "dabbling" in certain poisons outside of his regular occupations. Preventing the deceased from obtaining medical advice. Assuming exclusive duty of giving food or medicine. Removing and disposing of all vomited matter etc. Expressing an opinion that speedy death will follow an attack of sickness. Opposing a post-mortem examination. Hastening burial unduly. Giving a false account of the illness.

POST-MORTEM DIFFUSIONS OF POISONS.

An important question which has arisen in recent years in connection with the chemical evidence of poisoning is whether the detection of poisoning in such organs as the liver, kidneys, spleen, muscles, and brain is proof that the poison was administered during the deceased's life time.

Or to State it differently; suppose a poison say arsenic, to have been injected into the stomach, rectum or other cavity of the body after death; will the poison diffuse into the other organs of the body or will it remain confined to the cavity in which it is placed? This question arises most frequently in case of arsenical poisoning. If arsenic can only be transferred to the ^{organs} ~~body~~ by being absorbed into the circulation and deposited from it in the organs, then the detection of arsenic in the liver, kidneys, brain etc., would be direct proof that the poison had been administered during life and thereby create a very strong presumption that it was the cause of death.

But if upon the injection of arsenic into the body after death, it is also able to pass by diffusion into the various organs, then the presumption of death being caused by the poison detected in the body is weakened and if it is proven that in fact arsenic has been injected or even placed in contact with the body, the presumption, is entirely destroyed. As arsenic is an almost universal constituent of the embalming fluids used to prevent rapid decomposition, cases may occur in which the turning point would be the answer given to the above question.

Orfila made some experiments on this subject which led him to conclude that post-mortum diffusion took place. While this possibility was admitted by subsequent toxicological writers it was held to be a very rare occurrence; for it was believed that as soon as decomposition began, the arsenic was converted by the hydrogen sulphide generated during decay, into the yellow

sulphide of arsenic and as this is insoluble there could be no diffusion.

Such was the general opinion among toxicologists and medico-legal experts up to 1888. In that case the Millard murder trial occurred in Iona County Mich., in the course of which this point was raised and led to investigations by Dr. Vaughan that have radically altered the general opinion as to the ready diffusibility of arsenic after death.

The facts were briefly as follows: May 8th 1882, Mrs. Mathew^t Millard died after an illness of about two weeks, during which time she suffered from symptoms somewhat resembling those of arsenical poisoning. Shortly after death her husband, with the alleged intention of preserving the body, injected into the stomach and rectum about a teaspoonful of ^{white} arsenic (arsenic tri-oxide) suspended in a tea-cupful of water. Suspensions of poisoning having arisen, the body was exhumed 10 days after death and "six or eight ounces of liver and one-third of a kidney" placed in one jar and the stomach and a part of the rectum in another. Upon the analysis of these viscera by Prof. A. B. Frescott he discovered about 15 grains of arsenic tri-oxide in the stomach and rectum and a quantity in the liver and kidneys estimated to be from six to fifteen grains. It was claimed by the prosecution that the fact that arsenic was found in the liver and kidneys was proof that the arsenic was administered before death. On the other hand, Dr. Vaughan, as expert witness for the defense, testified that he believed that the arsenic found in the liver

and kidneys estimated could have passed into these organs by diffusion from the arsenic that had been injected into the stomach and rectum. In support of his position Dr. Vaughan afterward made some experiments which showed conclusively that when arsenic is injected into a dead body it passes freely by diffusion to all the organs and parts.

Jour. Amer. Med. Asso. 1, -115.

In the first experiment 50 grams of arsenic tri-oxide was injected into the stomach and rectum of a dead musk-rat. On analysis after being buried 25 days, arsenic was found in the liver, kidneys, heart, and brain. In a second experiment a human body was used which had been dead 2 or 3 days. An unweighed quantity of arsenic tri-oxide suspended in water was injected into the mouth and rectum. The body was laid away in a dry cellar for 25 days. The analysis of the various organs showed that they contained arsenic in the following quantities:

	Wt. of part	Wt. of As_2O_3	per cent of As_2O_3
Rt. Kidney	-----104	grams.-----	Distinct mirror--
Left kidney	-----20	"-----	.00705 gm-- .00705
Liver	-----365	"-----	.00310 " -- .00310
Lowerlobe of rt. lung	-----999	"-----	.04375 --- .04375
Heart	-----370.	"-----	.00199 ---- .00394
Section of colon	-----85.	"-----	.00652 ---- .03123
Rectum	-----22	"-----	1.6 ---- 7.5
Spleen	-----42	"-----	.00455 ---- .00947
Stomach	-----500	"-----	2.11200 ---- .70405
Brain	-----1022.	"-----	.00383 --- .00383.

"The arsenic in the brain probably came from the fluid being thrown into the nose, some regurgitated through the nostrils and probably left some arsenic adhering to the pharynx from whence it penetrated into the brain".

Experiments were also made by Prof. Ledzie using cats, which led him to conclude that when arsenic is injected into the alimentary canal after death and the body allowed to rest a considerable period that "the arsenic is as widely diffused through the body as if it had been administered during life". Other observers have since made numerous experiments on the subject and the uniform result has been that arsenic injected into the alimentary canal or placed in any part of the body and allowed sufficient time, say a month, that the arsenic will be found diffused throughout the entire body.

Jour. Amer. Med. Asso. 1, -115.

Consequently, it may now be regarded as a settled scientific fact that after death poisons diffuse to all parts of the body and therefore that the finding of the poison in the liver, kidneys, spleen, heart etc., is not proof that the poison was administered before death.

Before discussing the bearing of this question fact on the question of the evidence in a case of criminal poisoning there are some other points that may be considered. After the fact of post-mortem diffusion had been established it was suggested that the finding of arsenic in the brain and spinal cord might be proof that the poison had been carried into these organs by the circulation during the life of the individual, as it was no believed that the poison would reach these distant and well protected parts by post-mortum diffusion alone.

Reese's Toxicology, (2nd edition) p 227.
Medico-Legal Journal, Sep. 1888.

It is true that arsenic was found in the brain in both of Dr. Vaughan's experiments ^{described} ~~tried~~ above but he expressly stated that when the water contained in the arsenic was injected into the mouth some of the fluid returned through the nostrils. The nasal cavities and sinuses thus containing arsenic, it would be easy for it to diffuse into the brain. This, however, it was supposed would not happen if the poison had been introduced only into the stomach or rectum.

In order to decide this question experiments were made as follows: Rabbits were used and in order to prevent the arsenic from reaching the brain through the nostrils, the gullet was laid bare, opened and tied above the opening. The arsenical solution was then injected into the stomach. The bodies were buried from 10 to 74 days. In each case arsenic was detected in the brain, the spinal cord as well as in the contents of the urinary bladder.

Medico-Legal Journal, March, 1882.

Button experimented with the same results.

Amer. Chem. Jour. 7, -75.

Dogs were used in these experiments they were killed with chloroform and three grains of arsenic tri-oxide suspended in water was injected about twenty-four hours after death. The bodies were buried for different periods ranging from three to one-hundred two days. In each case arsenic was detected in the brain as well as the liver and kidneys though in two cases in which the bodies had only been buried ~~in~~ three days the tests were only faint stains in the tube of the Marsh apparatus.
See also, Ken. Researches Loomis' Lab. 1880. p. 52 to 58.

A recent interesting case is reported,
Jour. Amer. Chem. Soc. 15, -227.

A painter died Sep. 15 1881, the disease being diagnosed by the attending physician as remittent fever. Two hours after death the body was embalmed by thrusting an "embalming needle" into the abdomen and injecting an embalming fluid which contained 10 100 grains of arsenic tri-oxide and 10 grains of zinc sulphate in each fluid ounce. Suspicion of poisoning having arisen, the coroner took charge of the case and an autopsy was performed twenty-four hours after death. Extensive peritonitis and other pathological conditions confirming the diagnosis were discovered.

The brain however was removed and analysed. One half which weighed 715 grams contained one and six tenths milligrams arsenic tri-oxide. Small quantities of zinc were also detected, proving that the arsenic found in the brain had been deposited there by the diffusion of the embalming fluid. This case is remarkable from the extremely short time, - only twenty four hours - and the comparative large quantity, - one ^{and} six tenths milligrams - of the poison - that had reached the brain. The circumstances however, were very favorable to diffusion, - a large quantity of the fluid containing arsenic distributed throughout the abdominal and thoracic cavity.

Therefore it may be regarded as settled that the finding of arsenic in the brain or spinal cord is no proof that it was administered during life.

Since then the presence of arsenic in the brain and spinal cord is no indication whether the poison was administered during life or not; are there any other means by which this question can be determined? The answer must be that at present there is none.

Prof. Masse has suggested (Medico-Legal Jour., Sep., 1877.) that the finding of the poison in or on the exterior portions of the organs would be evidence of post-mortem diffusion but as the later investigations described above have shown how rapid and wide a spread the process is throughout the whole body, there is no probability that the exterior or interior portions of any organ, such as the liver or kidneys would exhibit any appreciable difference between the amount of arsenic found in a given weight of the substance of the organ. It has also been suggested (Medico-Legal Jour., March, 1880.) that the microscopist may be able, by the histological condition of the organs, to determine whether a poison has been introduced before or after death. However, the pathological conditions caused by post-mortem diffusion are nearly identical with those caused by many diseases and it is not probable that anything the microscopist would have to offer on this question would have much weight with a jury on whose decision hangs the fate of a fellow being.

The question next arises whether the fact of the post-mortem diffusion which has been proved to constantly occur in the case of Arsenic and its compounds will also hold good of other poisons. Assuming a priori it should be a natural infer-

ence that such would be the case. Arsenic tri-oxide is probably the most insoluble of any of the well known poisons and as the diffusibility depends upon the solubility of the substance, it is probable that post-mortem diffusion would take place even more readily than with arsenic.

This view is confirmed by some experiment made by McCracken
Reese's Toxicology, (second edition) p. 292.

Besides arsenic solutions a corrosive sublimate and tartar emetic were injected into the stomachs of dogs and cats. The bodies were then buried 3, 5, 6 and 7 weeks. After three weeks burial the poison in each case was discovered by chemical analysis in the liver, spleen and left kidneys. On the surface of these organs colored spots of the sulphides of the various metals were found.

After six and seven weeks burial the colored sulphides were more widely distributed, being found on both sides of the liver both kidneys all the intestines &c. chemical analysis revealed the poison in ^{all} the above organs. Although experiments as to the post-mortem diffusion with other poisons have not been recorded there is no doubt that similar diffusion would occur in the case of the other mineral poisons, ~~if the necessary conditions~~

~~As to~~ ^{As to} the vegetable poisons, ^{since} ~~in general~~ they are more soluble than the mineral poisons, post-mortem diffusion would doubtless occur if the necessary circumstances were present.

Owing however to the minuteness of the fatal dose of most of the poisons of this class and the great difficulty of the separation from the tissues and absolutely certain detection

of these small quantities, the question in relation to them will probably not be one of very much practical importance.

The effect of the scientific facts detailed above on the question of evidence may be summed up in the following proposition:

I. The discovery by any chemical analysis of any poison in the brain, liver, kidneys, muscles and other organs is not sufficient evidence that the poison was administered during the lifetime of the deceased.

II. In all cases in which the chemical analysis is the evidence of poisoning, the burden is on the prosecution to prove that the alleged poison could not have been placed in any cavity of the body or in contact externally with the body after death.

III. In case the same poison that is alleged to have caused death has been injected into the body in the process of embalming the value of the chemical evidence is entirely destroyed and even in those cases in which the poison injected is different from the one alleged to have produced death, nevertheless the strength of the evidence afforded by the chemical detection of the alleged poison will be greatly weakened.

The indiscriminate use of embalming fluid containing arsenic and other fluids is a practice calling for the most severe censure and should be prohibited by law.

The average undertaker is about the most stupid and ignorant individual in the community and having learned the use of an embalming fluid his first idea is to puncture the abdomen and fill it with an embalming fluid which is usually a solu-

tion of arsenic. In the case of the boy and girl mentioned in the proceedings of the Ass. Gen. 1880, this was done immediately after death or before the body had grown cold.

Such practices destroy evidence of crime so effectually as to would creation. The only object of this so called embalming is to prevent the rapid decomposition and unpleasant odors before burial. But this can be accomplished just as well by the use of ice and a properly constructed ice-box in which "embalming" should be prohibited.

In this connection the question has sometimes arisen whether the arsenic sometimes present in the soil might not have reached the body through the action of the rain water percolating through the soil. In the Jackson's case this was tried in New York in 1880 this question was raised by the defense and the soil of Greenwood cemetery, the road and nails and screws of the coffin and the shroud were analyzed but no traces of arsenic were found.

Crim. Law Sec. 1, 1880.

1880, Crim. Law, Sec. 1, 1880.

Many features of this case resembled the Willard case. The poison, arsenic, was administered in small doses producing apparently a case of natural disease. However as no "embalming" or injections had been made in the body the chemical analysis furnished evidence that convicted the poisoner who was accordingly executed.

In some parts of France, however, notably in the town of the Vosges the soil contains a considerable amount of arsenic and the countries in these countries hold themselves in.

arsenic bearing soil the subject has received considerable attention from European Toxicologists.

Comptes Rendu 100, 1382

Jahresbenetite für Pharmace Toxicologist vol.
for 1887 p.586 & 587; vol. for 1888 p.582.

The arsenic in the soil is usually if not always present as arsenite of iron or in some combination with calcium compounds. These are insoluble in cold water and these soils treated with water failed to give up any of the arsenic into solution. Further when a solution of arsenic even of the most soluble forms such as sodium arsenite is placed in contact with soil the arsenic is fixed by the soil and rendered insoluble. When such solutions were thrown on the soil it was found that the greatest depth to which the arsenic penetrated was .2 of a meter.

Therefore it is not possible for a body to absorb arsenic from the soil by the percolation of rain water even where arsenic exists in the soil.

It is also sometimes claimed by the defense that the arsenic found in a body may have been administered as an impurity in medicine and accumulate in the organs. It is true that arsenic is often present as an impurity in some drugs, especially in bismuth sub-nitrate. Out of 14 samples analyzed by Chittenden and Lambert only one sample was absolutely free from arsenic.

Amer. Chem. Jour. 2, 386.

In order to test whether the arsenic would accumulate in the system, a sample of bismuth sub-nitrate was taken which con-

tained .01226 % of Arsenic trioxide and 532 grams were fed to a dog during a period of five weeks. The total amount of arsenic

tri-oxide thus administered was 66.03 milligrams and during the last three weeks he was fed 2.38 milligrams As_2O_3 daily. The dog being killed and the organs analysed, arsenic was found in the liver, spleen, brain and blood in such mere traces as to be unweighable. The stomach contained 36 milligrams As.

" larger intestines contained .6mil.As.

" small " contained 2.1mil.As.

This shows that arsenic does not accumulate in the organs.

When administered in non poisonous ^{doses} ~~drugs~~ the arsenic will ordinarily be eliminated from the body at the end of 15 days.

Another point worthy of passing notice is the distribution of arsenic in the body after death. As we have seen, in the case of the injection of the arsenic after death it sooner or later reaches all parts of the body. It would in all probability be found most abundantly in the parts nearest the seat of injection and in smallest quantities in the most distant parts.

Much would also depend upon the length of time the process of diffusion had been acting, the amount of moisture contained in the tissues and the form of the poison.

Concerning the distribution of the poison when administered during life and producing death there has been considerable observation and experiment.

In the first place in some cases of acute poisoning the poison may be so completely removed by vomiting and purging that it cannot be detected at all by chemical analysis and

still be the cause of death. It is believed however that such cases are rare and in fairly rapid acute cases of acute poisoning the poison is found in the intestinal tract and in the ^{eliminating} great ~~stimulating~~ organs, the liver, spleen and kidneys.

In chronic poisoning by arsenic the net results of various investigations seems to be as follows: The experiments of Scolesuboff, (Archives de Physiologie No. 5 Aug. & Sep. 1875.) shows that where a really soluble arsenite is used that the arsenic possesses a noted selective action towards the brain and spinal cord.

On the other hand the experiments of Johnson and Chittenden on dogs, and observations on several cases of criminal poisoning Amer. Chem. Jour. 8, 332.
Rep. Yale Col. Phys. Chem. for 1884 & 1885.

indicate that in case the arsenic has been administered in the form of the difficultly insoluble form of arsenic tri-oxide that very little is found in the brain, only the merest traces in most instances.

A point worthy of notice in connection with arsenic poisoning is a source of error lately discovered in the estimation by the Marsh test method.

Analyst 17 -p12.
Liebig's Annalen for 1881, 255 & 256.

In order to facilitate the evolution of hydrogen in the flask it is the common practice to add a few drops of platinum-Chloride. This will lead to the retention of part of the arsenic in some way, -possibly as an amalgam with the reduced platinum.

In case the amount of arsenic is very small it may all be retained.

PTOMAINES

Another discovery of modern science bearing on criminal poisoning is that of the production of ptomaines during the decomposition of animal substances. These ptomaines are algaloidal substances among which some resemble some of the vegetable alkaloids by the symptoms they produce; others by their chemical reaction, while others again when present in the same solution mask the characteristic reactions of vegetable alkaloids.

If the detection of a vegetable poison depends on its separation from animal tissues in which decay has begun, it will be readily seen that the existence of these ptomaines becomes a most important question.

In a trial for poisoning in Russia in 1874 a substance was discovered by the analyst which he claimed to be conine, but which was pronounced by the distinguished toxicologist Otto to be neither conine, nicotine or any vegetable alkaloid with which he was acquainted.

Ciotta obtained from a slightly decomposed body an alkaloid which gave the color and other characteristic reactions of strychnine but which was not crystalline and only slightly bitter. In the Songoza trial at Cremona Italy, an alkaloid resembling morphine in the reaction was found.

Substances resembling atropine, digitaline, viratrine, dephinine, ^{conine}~~chlorine~~ and nicotine and other vegetable alkaloids have been extracted from decomposing animal substances.

ptomaines & Leucomaines, Vaughan & Novy.

The question has arisen in at least two American cases; the

Harris trial in New York City, Oct. 1891, and the Buchanan trial in the same city in Apr. 1893. In both of these cases medical men were accused of poisoning their wives by morphine. In the Harris case the body was exhumed 54 days after death and Prof. Witthaus claims to have discovered morphine in the viscera. In the Buchanan case the same chemist claimed to have discovered morphine after the body had been buried 44 days. According to his testimony he had extracted the acidified organs with petroleum ether, benzole, and amyl alcohol in the order given then making them alkaline extracted with the same reagents in the same order. With the residue from the amyl alcohol extract he obtained reactions which he claimed indicated morphine.

Dr. Vaughn as expert witness for the defense obtained similar results with an extract of pancreas.

In both of these cases the accused were convicted: principally it is believed, on evidence of bad characters, previous declarations that "I will kill the old hag" etc. From a scientific standpoint the chemical evidence in these cases was absolutely worthless.

The whole subject of animal and vegetable alkaloids in relation to criminal poisoning is one presenting great difficulties and presents a wide field for research by toxicologists and legal chemists.

The criminal is never slow to avail himself of the latest results of science and these results described above have been in his favor. If the law is still to remain the protection of society and human life it must also apply the latest and ever advancing results of science to the detection of secret crime.

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